1/26/18

HW: "Inverses of Functions" HW section

AIM: How do we find Inverses of Functions?

Warm Up:

1) GIVEN $f(x)=2x+9$ *and* $g(x)=\frac{x-9}{2}$. EVALUATE $f(g(2))$

$g(2)=\frac{2-9}{2}=\frac{-7}{2}$

$\boxed{f(g(2))=2}$

$f\left(\frac{-7}{2}\right)=2\left(\frac{-7}{2}\right)+9=2$

***Exercise* #1:** Consider the two linear functions given by the formulas $f(x)=\frac{3x+7}{2}$ and $g(x)=\frac{2x-7}{3}$.

(a) Calculate $f(5)$ and $g(11)$.

$$f(5)=\frac{3(5)+7}{2}=\boxed{11}$$

$$g(11)=\frac{2(11)-7}{3}=\boxed{5}$$

(b) Calculate $f(0)$ and $g\left(\frac{7}{2}\right)$.

$$f(0)=\frac{3(0)+7}{2}=\boxed{\frac{7}{2}}$$

$$g\left(\frac{7}{2}\right)=\frac{2\left(\frac{7}{2}\right)-7}{2}=\frac{0}{3}=\boxed{0}$$

(c) Calculate $f(g(-1))$.

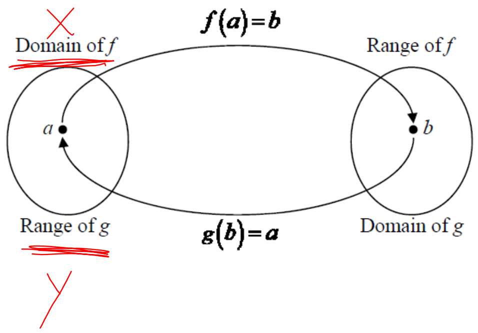
$$g(-1)=\frac{2(-1)-7}{3}=-\frac{9}{3}=-3$$

$$f(-3)=\frac{3(-3)+7}{2}=-\frac{2}{2}=\boxed{-1}$$

(d) Without calculation, determine the value of $f(g(\pi))$.

$$f(g(\pi))=\pi$$

The two functions seen in Exercise #1 are inverses because they literally "undo" one another. The general idea of inverses, $f(x)$ and $g(x)$, is shown below in the mapping diagram.



Exercise #2: If the point $(-3, 5)$ lies on the graph of $y = f(x)$, then which of the following points must lie on the graph of its inverse?

x y

(1) $(3, -5)$ (3) $(5, -3)$

(2) $(-5, 3)$ (4) $\left(-\frac{1}{3}, \frac{1}{5}\right)$

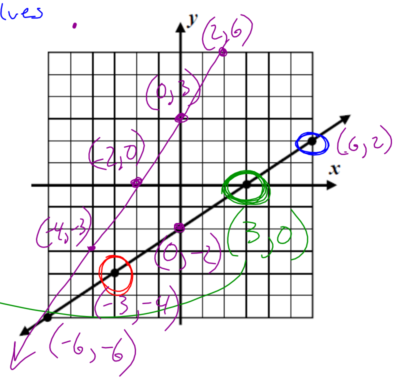
Inverse switches the x and y-values.

Inverse functions have their own special notation. It is shown in the box below.

INVERSE FUNCTION NOTATION
If a function $y = f(x)$ has an inverse that is also a function we represent it as $y = f^{-1}(x)$.

Exercise #3: The linear function $f(x) = \frac{2}{3}x - 2$ is shown graphed below. Use its graph to answer the following questions.

These are y-values on $f(x)$



(a) Evaluate $f^{-1}(2)$ and $f^{-1}(-4)$.

$f^{-1}(2) = 6$ $f^{-1}(-4) = -3$

(b) Determine the y-intercept of $f^{-1}(x)$.

(the x-intercept on $f(x)$)

$(0, 3)$

(c) On the same set of axes, draw a graph of $y = f^{-1}(x)$.

To find the equation of an inverse, switch the x and y-values.

recall $y = f(x)$

$f(x) = \frac{2}{3}x - 2$

OR

$y = \frac{2}{3}x - 2$ inverse

$x = \frac{2}{3}y^{-1} - 2$

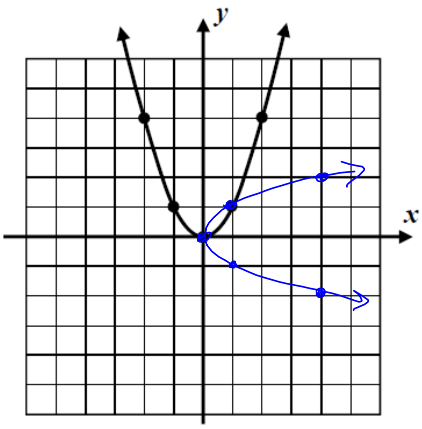
rewrite

$x + 2 = \frac{2}{3}y^{-1}$

$\frac{3}{2}(x+2) = y^{-1}$

***Exercise* #4:** A table of values for the simple quadratic function $f(x) = x^2$ is given below along with its graph.

x	-2	-1	0	1	2
$f(x)$	4	1	0	1	4



(a) Graph the inverse by switching the ordered pairs.

x	4	1	0	1	4
$f^{-1}(x)$	-2	-1	0	1	2

(b) What do you notice about the graph of this function's inverse?

The inverse is not a function

EXISTENCE OF INVERSE FUNCTIONS

A function will have an inverse that is also a function if and only if it is one-to-one. Hence, a quick way to know if a function has an inverse that is also a function is to apply the Horizontal Line Test.